TRACTOR WITH INTEGRATED CAB FLOOR FUEL TANK

BACKGROUND OF THE INVENTION

[0001] 1. Technical Field:

[0002] The invention relates to motor vehicle fuel storage systems and more particularly to a fuel tank directed to reducing fuel starvation and sloshing problems.

[0003] 2. Description of the Problem:

[0004] Over the road truck tractors have conventionally carried their fuel supply in two cylindrical tanks which are hung, one each, to the outside of the vehicle frame, low on the vehicles' frame rails. This arrangement is referred to as a dual draw tank system. Dual draw tank systems present a number of problems relating to fuel delivery to the vehicle's engine and to vehicle stability.

[0005] The use of dual draw tanks can result in uneven fuel draw into the engine since each tank is drawn from independently. Uneven fuel draw can result in differences in the fuel levels in the tanks. Differing fuel levels in the tanks usually means that the tractor is differentially loaded from side to side and this can affect cornering stability. The difference in fuel level may be difficult to ascertain as well. Also, as the tanks are drained, the fuel remaining in the tanks becomes prone to sloshing back and forth, which can affect stopping and acceleration, ride and handling performance. Fuel sloshing has in the past been partially dealt with by incorporating baffles in the fuel tank.

[0006] Cylindrical fuel tanks are, despite various efforts to correct the problem, prone to rotation. This may stem over the long term from vehicle vibration. Tank rotation can require expensive repair. Cylindrical fuel tanks have not been consistently located on trucks, resulting in the need to provide numerous alternative support arrangements for other equipment on truck tractors, such as battery boxes and tool boxes.

SUMMARY OF THE INVENTION

[0007] According to the invention there is provided a vehicle substructure comprising a floor section and a support frame disposed beneath and adjacent to the floor section, the support frame including a stamping having a raised, rectangular perimeter wall with an upper edge in contact with the floor section and a plurality of support ribs within the raised, rectangular perimeter wall each of which are orthogonal with respect to a side thereof. Reservoirs are formed in the stamping between and defined by the ribs, the raised, rectangular perimeter wall and a base from which the raised, rectangular perimeter wall and the ribs rise. Channels are located through the dikes to interconnect the reservoirs into a single fuel tank.

[0008] Additional effects, features and advantages will be apparent in the written description that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself however, as well as a preferred mode of use, further objects and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

[0010] **Fig. 1** is a perspective view in partial cutaway of a truck tractor with an integrated cab floor fuel tank.

[0011] **Fig. 2** is a perspective view of the cab floor fuel tank of the present invention.

[0012] **Figs. 3A-B** illustrate fuel tank pan for the integrated cab floor fuel tank.

[0013] **Fig. 4** is a perspective view of the edge rim of the cab floor fuel tank pan of **Fig. 3**.

[0014] **Fig. 5** is a front cab mount support point from the pan.

[0015] **Fig. 6** is a perspective view of a reinforcement bracket undergirding a pan dike.

[0016] **Fig. 7** is a exploded view of a foam filler and pan reservoir combination.

[0017] **Fig. 8** is a perspective view of a pan drain.

[0018] **Fig. 9** is a perspective view of a channel defined by a pan dike and an exterior perimeter wall.

[0019] **Fig. 10** is a perspective view of a cab side illustrating positioning of the cab floor fuel tank of the invention.

[0020] **Figs. 11** and 12 illustrate substitution of the cab floor fuel tank for a tractor modesty panel.

[0021] **Fig. 13** is a side elevation of suspensions for a cab floor fuel tank and a driver seat mounted on the cab floor fuel tank.

DETAILED DESCRIPTION OF THE INVENTION

[0022] Referring now to the figures and in particular to **Fig. 1**, a tractor **10** is illustrated incorporating the integrated cab floor fuel tank **18** of the invention. Tractor **10** is constructed on two longitudinally aligned frame rails **12** and **13**. Integrated cab floor fuel tank **18** is disposed between the remainder of cab **15** and the frame rails **12** and **13**. Cab **15** is defined by a passenger side side wall **16**, a forward dash panel **60**, a driver side side wall **50**, a back wall **17**, a roof **14** and integrated cab floor fuel tank **18** located at the

bottom of the cab. Cab floor fuel tank **18** supports several features of the cab including driver and passenger seats **42** and **44**, and a rear bunk **20**, all of which are mounted to the cab floor fuel tank.

[0023] Integrated cab floor and fuel tank **18** is illustrated in isolation in **Fig. 2**. Cab floor/fuel tank **18** comprises a floor section or deck **22** and a pan **24**. Deck **22** provides the upper portion of cab floor/fuel tank **18** and has an upper surface exposed to the truck interior on which vehicle occupants can walk and which faces the supports for objects such as seats and bunks. Support and attachment points **28** are provided distributed around the deck **22**. In a normal application deck **22** is generally rectangular. A opening **34** is provided through deck **22** toward the forward edge of the deck, allowing access to a void **32**. Void **32** is intended to provide space for installation of a transmission linkage if required for a vehicle with a manual transmission.

[0024] The lower section of cab floor/fuel tank **18** is provided by pan **24**, which provides a plurality of reservoirs for fuel storage. A fuel return line **26** from a vehicle engine is provided into pan **24** along the forward edge of the pan. Front cab mounting points **36** and rear cab mounts **30** are also provided along the forward and trailing edges of deck **22**, respectively.

[0025] **Figs. 3A** and **B** illustrate pan **24** for integrated cab floor/fuel tank **18** in greater detail. Pan **24** is preferably a single piece, steel stamping, and may be viewed as having a plurality of depressions, most of which are utilized as fuel reservoirs **50**, **52**, **54**, **56**, **58**, **70** and **72**. Void **32** is included among the depression, but is reserved for providing space for the shift linkage for a standard transmission. Separating depressions **32**, **50**, **52**, **54**, **56**, **58**, **70** and **72** are a plurality of raised rails or dikes **78**, **80**, **82**, **84**, **86**, **88** and **90**. Dikes **78**, **80**, **82**, **84**, **86**, **88** and **90** are oriented either longitudinally (dikes **78** and **80**) or latitudinally (the remainder) and are situated to replace a skeletal frame which supports permanent cab furnishings, e.g. seats, bunks, etc.

[0026] Depressions **50**, **52**, **54**, **56**, **58**, **70** and **72** intended for fuel storage are

interconnected to one another by a series of channels or gaps **92**, **94**, **96**, **98**, **100** and **102** left in dikes **78**, **80**, **82**, **84**, **86**, **88** and **90**. Channels **92**, **94**, **96**, **98**, **100** allow fuel to flow from one reservoir to an adjacent reservoir. Each of depressions **50**, **52**, **54**, **56**, **58**, **70** and **72** intended for fuel storage is connected by at least one channel to an adjacent depression. The positions shown for channels **92**, **94**, **96**, **98**, **100** are preferably selected to assure that fuel eventually drains to depression **56**, from which fuel is drawn through a drain **76**. Depression **56** is located centrally from side to side of pan **24** and toward the back of the pan. In order to assure that fuel eventually drains to depression **56** the rear end of pan **24** is slightly lower than the forward end of the pan. Alternatively, the floors to the fuel storage depressions **50**, **52**, **54**, **56**, **58**, **70** and **72** may be tilted to achieve the same result. For depressions **58**, **72**, **50** and **54** which have one outlet each, the floor of the depression should have its lowest point (when the vehicle is level) adjacent channels **98**, **100**, **90** and **94**, respectively. The floors of depressions **70** and **52** should have their lowest points adjacent channels **102** and **96** to depression **56**, respectively. Depression **56**, which includes drain **76**, has the drain as its lowest point. Fuel is of course not limited to flowing in one direction through channels **92**, **94**, **96**, **98**, **100.** Fuel returned or added to any one of depressions **50**, **52**, **54**, **56**, **58**, **70** and **72** by a filler pipe or return line flows through the channels into the remaining depressions.

[0027] Pan **24** is further provided with a four sided perimeter sill **74** which extends outwardly and horizontally on top of a four sided perimeter wall **45**. Perimeter wall **45** may be interrupted at various points by upward breaks associated with various of the dikes **78**, **80**, **82**, **84**, **88** and **90**. The interior face of perimeter wall **47** forms one or more of the sides of depressions **32**, **50**, **52**, **54**, **56**, **58**, **70** and **72**.

[0028] **Fig. 3B** illustrates one possible arrangement of channels where pan **24** is tilted to lower the rearward edge of the pan. Drain **76** is located adjacent the rearward edge of perimeter wall **45**, being substantially co-located with the lowest point in the chain of reservoir depressions **50**, **52**, **54**, **56**, **58**, **70** and **72**. Fuel from Channels **98**, **100** and **112** connect depressions **58**, **70** and **72** to depression **56** along one side of the vehicle.

Channels **90**, **88** and **110** connect depressions **50**, **52** and **54** to depression **56** along the opposite side of the vehicle.

[0029] Referring to **Fig. 4** the rear portion of perimeter sill **74** is illustrated in a partial cutaway view to expose a two plane rear sill reinforcement bracket **116** which is nestled up under the perimeter sill. Similarly **Figs. 5** and **6** illustrate the addition of reinforcement channels **120** and **122** to longitudinal and latitudinal dikes **180** and **182**. A channel **120** supporting dike **180** provides a front cab mount reinforcement attachment point. Dike **182** and reinforcement channel **122** are representative of the support provided for attachment of a seat and include modifications for installation and support of a seat including a tap hole **126** through dike **182** for insertion of a bolt for securing a seat and tap hole **124** with an associated nut **128** on reinforcement channel **122**. Nut **128** is typically welded to the bottom of channel **122**. Hole **124** is located axially aligned with a tap hole through dike **182**.

[0030] As represented by **Fig. 7**, fuel depressions **50**, **52**, **54**, **56**, **58**, **70** and **72** preferably each contain a foam insert such as illustrated by foam insert **130** for an exemplary depression **150**. Foam insert **130** is preferably a reticulated polyurethane block marketed as Explosion Suppressant Foam. The material is easily fabricated to conform to the interior shape of most any reservoir. The foam effectively controls fuel surging and sloshing and is available in the United States from Crest Foam Industries, Inc., 100 Carol Place, Moonachie, New Jersey 07074.

[0031] **Fig. 8** illustrates in detail an area surrounding a drain **76** located on the floor **132** of depression **56**. Shallow channels **134** in floor **132** focus fuel flow toward drain **76**.

[0032] Channels between fuel storage depressions in pan **24** are preferably located along perimeter wall **45** which leaves larger sections of the wall, particularly along the side of the vehicle, uninterrupted and smooth. **Fig. 9** illustrates location of a channel **100** between dike **84** and a section of perimeter wall **45** which leaves the perimeter wall uninterrupted.

[0033] Referring to **Fig. 10**, some of the modifications which are possible for a truck tractor **10** after removal of fuel storage to an under cab position are illustrated. A deck plate **158** is visible under driver side **50** and perimeter wall **45** of fuel tank **18**. Outward from deck **18** is a battery box **152**. The removal of the cylindrical fuel tank allows the position of the battery box **152** to be standardized, since its location no longer depends upon the size of cylindrical fuel tank used on the vehicle. Located aft of battery box **152** is a rear cab access step **154**. **Figs. 11** and **12** illustrate how perimeter wall **45** substitutes for a modesty panel **152** formerly installed on the vehicle for cosmetic reasons.

[0034] **Fig. 13** illustrates disposition of a driver's seat **42** supported on fuel tank **18**. Fuel tank **18** is preferably supported along its rear edge on a combination air spring, shock dampening suspension element **160**. Seat **42** has an undercarriage **164** which is mounted on deck **22** over dike **82**, which carries the weight of the seat. Suspension element **160** fits into a non-depressed portion of fuel tank **18**, and rests on a cross member **130** between the frame rails **13** and **12**.

[0035] The invention provides simplification in tractor construction by allowing the replacement of cylindrical, strap on fuel tanks and cab floor sub-assemblies by use of a single, dual purpose, sub-assembly. No sacrifice in structural integrity of the cab should result. The fuel tank itself is well protected. Squeaks associated with rotation of cylindrical fuel tanks within their straps should be eliminated, contributing to creating an impression of a solidly built tractor cab. Fuel sloshing should be substantially eliminated improving vehicle handling. The need for fuel balancing between two outwardly disposed tanks is eliminated and thus the need for connections between the tanks and any pumps or check valves used in a balancing system is also eliminated.

[0036] While the invention is shown in only one of its forms, it is not thus limited but is susceptible to various changes and modifications without departing from the spirit and scope of the invention.